

Task 468
FY99 EOD/LIC PROGRAM
CANDIDATE PROJECT SUMMARY

Project Title: Area Survey Imaging Sonar (ASIS)

Submitting Organization: Applied Physics Laboratory, University of Washington, Seattle, WA

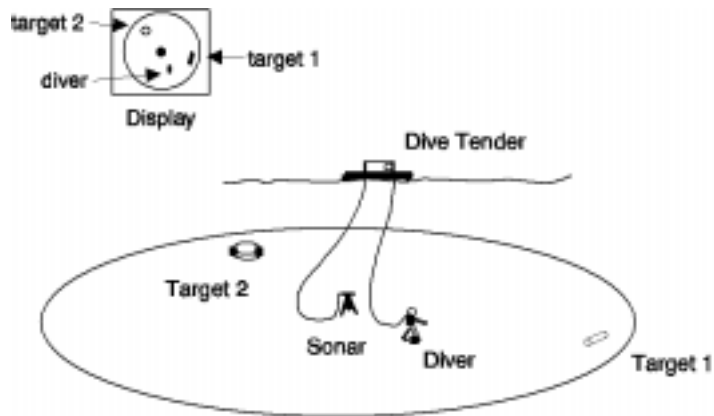
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Existing Operational Requirement: There is currently no written operational requirement

Specific Technical/Operational Need: MDSU, MCM, and EOD Dets on UXO surveys, airplane crashes, and general clean-up exercises will greatly benefit from this system. Frequently divers encounter turbid water during search and recovery operations, harbor surveys, and salvage operations. The lack of visibility and loss of direction hamper successful completion of the mission. When the video and photographic systems cannot operate in the turbid water, it is impossible to provide the topside with images and thus impedes topside's command of the mission. Frequently divers need both hands to perform their assigned tasks. An imaging system need not tie up their hands.

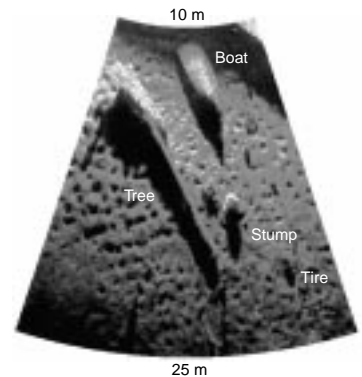
Proposed Technical Approach: ASIS would consist of a high-resolution scanning sonar on an adjustable tripod, a laptop style computer for topside display and control, and a display mounted on the helmet, mask, or wrist of the diver. The sonar would scan 360° or only a sector of a circle if so desired. The topside display and diver display would show bottom features and objects on the bottom. The displays would also show the position of the diver. Topside Command could highlight which targets the diver should investigate and send written comments. The diver would quickly orient himself and walk toward the object of interest. The color video, diver display, developed at Coastal Systems Station, is very small. Its video cable would be added to existing tending lines. The diver's hands would remain free to efficiently accomplish the mission. The sonar, tripod, cables, topside computer, and display would be rugged, easy to assemble, and use in difficult situations. The diameter of the imaged circle would be 100 meters giving the diver ample search space without having to frequently move the tripod. If the targets are too small or the bottom too hilly, shorter ranges (25-m or 12-m radius) could be used.

The sonar would mount on a tripod that provides a stable platform approximately 4 feet off the bottom. The sonar soundhead would rotate analogous to radar. The electronics would format the returns and send them to the surface by way of cable. On the surface, the data would be displayed on a laptop computer and sent to the diver display as well. The sonar resolution would be 0.25° to give a cross-range resolution of 10 cm (4") at the 25-m range. Thus, in a circle of 50-m diameter



the worst case cross-range resolution would be 4". APL-UW ran some experiments with a mechanically scanned sonar with of 0.25° resolution. One of the resulting images is shown below. This is the image of objects on the pockmarked bottom of a lake. The image covers the range from 10 m to 25 m from the sonar. On the bottom one sees an upside down rowboat, a waterlogged tree, a sawed stump perpendicular to the bottom and, an automobile tire. The sonar we propose would have this resolution and allow the diver to “see” with this clarity (actually the video display is better than this printout) in zero visibility water.

Existing Capabilities: Dive units use the 2α, helmet-mounted cameras, and side-scan. The 2α can be difficult to interpret. The cameras work fine if the visibility is good, but are useless in turbid water. Side scan sonars provide an initial map but do not provide real-time feedback to the diver as he attempts to approach objects on the bottom. Sonars like ASIS exist commercially but their resolution is 1.7°. ASIS with 0.25° resolution gives seven times better resolution and it shows. Missions will be more efficient and less dangerous.



Schedule and Cost: 24 months and \$370k (Production units will be much less expensive)

Task	Quarters after funding							
	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th
1. Develop system design	—							
2. Fabricate first prototype		—	—	—				
3. Test first prototype with dive units				—	—	—	—	
4. Design second prototype					—	—		
5. Fabricate second prototype						—	—	
6. Test second prototype with dive units								—
7. Develop transition strategy								—
8. Write final report								—
Cost Summary (\$k)	20	40	60	50	60	60	50	30

Delivery:

- 1) Two Area Survey Imaging Sonars (MOD1 and MOD2)
- 2) Training, and Maintenance over the contract period, and a
- 3) Final Report